

SCHOOL OF ENVIRONMENTAL AND EARTH SCIENCES



'A' Grade
NAAC Re-Accredited
(3rd Cycle)

A (2.88)
NAAC RE-ACCREDITED

KAVAYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERSITY, JALGAON

REVISED SYLLABUS

(With CGPA System) FOR

M. A. / M. Sc. (Applied Geography)

w. e. f.

July, 2018

SCHOOL OF ENVIRONMENTAL AND EARTH SCIENCES
Kavayitri Bahinabai Chaudhari North Maharashtra
University, Jalgaon

SEMESTER WISE DISTRIBUTION OF COURSES

M. A. / M. Sc. (Applied Geography) SEMESTER-I

W. E. F. JUNE 2013-14

- Gg. 101: Geomorphology
- Gg. 102: Environmental Geosciences
- Gg. 103: Fundamental of Cartography
- Gg. 104: Practical's in Physical Geography
- Gg. 105: Cartographic Techniques with Help of GIS
- Gg. 106: Tutorials – I

M. A. / M. Sc. (Applied Geography) SEMESTER-II

W. E. F. JUNE 2018-19

- Gg. 201: Fundamental of Human Geography.
- Gg. 202: Climatology & Oceanography.
- Gg. 203: Geo-Statistics & Research Methodology.
- Gg. 204: Practical's in Human Geography
- Gg. 205: Practical's in Climatology and Oceanography.
- Gg. 206: Tutorials - II

M. A. / M. Sc. (Applied Geography) SEMESTER-III

W. E. F. JUNE 2014-15

- Gg. 301: Geography of Resources.
- Gg. 302: Fundamental of Remote Sensing.
- Gg. 303: Fundamental of Geographical Information System & GPS.
- Gg. 304: Practical's in Remote Sensing and Image Processing.
- Gg. 305: Practical's in GIS & GPS Techniques with Help of Computer.
- Gg. 306: Seminar - I

M. A. / M. Sc. (Applied Geography) SEMESTER-IV

W. E. F. JUNE 2018-19

- Gg. 401: Watershed Management and Planning.
- Gg. 402: Agricultural Geography.
- Gg. 403: Regional Geography of India and Maharashtra.
- *Gg. 404: Instrumentation and Surveying.
- Gg. 405: Project Work and Dissertation.
- Gg. 406: Seminar - II

*Employability and Skill Development Courses

SCHOOL OF ENVIRONMENTAL AND EARTH SCIENCES
Kavayitri Bahinabai Chaudhari North
Maharashtra University, Jalgaon

COURSE STRUCTURE WITH CREDIT

M. A. / M. Sc. (Applied Geography)

	Course	Marks	Hrs./Week	Credit	Total
Semester I	GG -101	100	04	04	21
	GG -102	100	04	04	
	GG -103	100	04	04	
	GG -104	100	08	04	
	GG -105	100	08	04	
	GG -106	40	01	01	
Semester II	GG -201	100	04	04	21
	GG -202	100	04	04	
	GG -203	100	04	04	
	GG -204	100	08	04	
	GG -205	100	08	04	
	GG -206	40	01	01	
Semester III	GG -301	100	04	04	21
	GG -302	100	04	04	
	GG -303	100	04	04	
	GG -304	100	08	04	
	GG -305	100	08	04	
	GG -306	40	01	01	
Semester IV	GG -401	100	04	04	21
	GG -402	100	04	04	
	GG -403	100	04	04	
	GG -404	100	08	04	
	GG -405	100	08	04	
	GG -406	40	01	01	

Grand Total: 84

JOB OPPORTUNITY

Geography has wide range of applications in fields like transportation, environmental sciences, airline route and shipping route planning, civil services, cartography (map making), satellite technology, population council, meteorology departments, education, disaster management are some of the careers. The job role as well as nature of work varies depending upon the job profile. Some of the popular opportunities within the field of geography in India include economical geography, cultural geography, political geography, historical geography, tourism geography, regional geography, and climatology and so on. One can specialize in related fields and become a geographer.

- **Govt Department:** A geographer can avail job opportunities in government departments (like planning and developmental commissions, forestry, environmental, and disaster management departments etc), travel agencies, manufacturing firms, text book and map publishers, media agencies, etc.
- **Cartographer:** Many people choose to work as a cartographer who is a person with extensive knowledge about maps and is involved in making maps, charts, globes, and models of Earth and other planets.
- **Surveyor:** Many others with a degree in geography also opt to work as a surveyor. A surveyor is the person who is involved in measuring the surface of land, distance between two places through mathematical calculations. Their job involves lot of on the field work and is majorly recruited by state and central survey departments, construction companies and so on. At SY and TY level Plane Table Survey, GPS Surveys are included in the syllabus. Many posts of surveyors are vacant in privet sector and Govt. department of survey.
- **GPS Surveyors:** In recent days, even the fields of GIS as well as Remote Sensing are providing job opportunities to people with the educational background in geography and related specializations. And not to forget the management of the lifelines of most modes of transport that occurs via travel and tourism wherein people with a background in geography are often recruited (along with the required certifications) as tour operators, itinerary planners, tour guides and so on. Also those with PhD or relevant masters can also opt to teach the subject at school, college or masters level or may be involved in developing educational content for the relevant subject. Indeed, it is correctly said that geography is everywhere and opens our eyes to the world we live in, and so for those curious souls who love to know more and explore about the earth, the road towards geography may lead you to your destination! Get going...
- **GIS and Remote Sensing Fields:** Geography as a career provides multiple job options. With the increased use of satellite technology and Geographical Information System, geography is becoming a more promising career option than it was ever before. The GIS is a computer based information system which is used to digitally represent and analyses the geographic features present on the earth surface.
- Geographers provide their services in diverse fields. There are comparatively few geographers so they are in high demand at national and international level. The remuneration depends on the potential, experience, seniority and type of organization. Generally private companies pay awesome wage along with other benefits, when compared with the government and public organization. In the field of geography, a qualified person can expect a starting salary somewhere

around Rs. 15,000 - 25,000 per month. The senior persons in private sector may draw more than Rs.1,20, 000 per month. Consultants also get attractive consultancy fees.

- **Drafter:** He/she associate closely with engineers and architectures. It involves planning, housing and development projects in terms of their location and utilization.
- **Government employer:** Central government agencies employ geographers for mapping, intelligence work and remote sensing interpretation. State and local governments employ geographers on planning and development commissions.
- **Urban and regional planner:** Concerned with planning, housing and Development projects with respect to their location and utilization of available land-space.
- **GIS specialist:** City governments, county agencies and other government agencies and private groups are often in need of experienced GIS professionals.
- **Climatologist:** Agencies viz. National Weather Service, news media, the Weather Channel and other government entities occasionally need climatologist. A geographer with experience and vast coursework in meteorology and climatology serves as the best climatologist.
- **Transportation manager:** The regional transit authorities or shipping, logistics and transportation companies requires in transportation geography.
- **Environmental Manager:** The environmental assessment, clean-up and management companies require a geographer for environmental impact reports. It's often a wide-open field with tremendous growth opportunities.
- **Science (Geography) writer:** One can serve as a science writer or a travel writer for a magazine or newspaper.
- **Researcher:** Many Government and non-government institutes along with research centres offers several career options for qualified geographers with numerous specializations.
- **Urban planner.**
- **Teacher/Professor:** The college teachers, school teachers and university teacher. Depending upon the experience and degrees obtained.
- **Demographer:** In government and research organizations.
- **Government officer:** Geographical Survey of India/State and Central government provides job opportunities.
- **Careers in Indian Navy:** The Indian Navy is the seventh largest in the world and is a well knit, cohesive fighting force with tri dimensional capabilities. The Indian Navy provides you all the training you need and help you make the most of what you have your talents, your skills, your spirit and your aspirations. You get very challenging job and get chance to travel widely.

**KAVAYITRI BAHINABAI CHAUDHARI
NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.A. / M.Sc. APPLIED GEOGRAPHY**

SEMESTER I

W. E. F. JUNE 2013-14

Semester I

- Gg. 101: Geomorphology
- Gg. 102: Environmental Geosciences
- Gg. 103: Fundamental of Cartography
- Gg. 104: Practical's in Physical Geography
- Gg. 105: Cartographic Techniques with Help of GIS
- Gg. 106: Tutorials -I

Semester II

W. E. F. JUNE 2018-19

- Gg. 201: Fundamental of Human Geography.
- Gg. 202: Climatology & Oceanography.
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M.A. /M.Sc. APPLIED GEOGRAPHY
SYLLABUS
Semester I
(w. e .f. June 2013-14)
Gg. 101: GEOMORPHOLOGY

Unit No.	Title	Periods
1	Geomorphology a) Nature and Scope i. Definition and history of Geomorphology b) Concepts i. Uniformitarianism and Catastrophism ii. Geomorphic Scale – Timescale (Cyclic, Graded and Steady) and Spatial Scale iii. Recent trends in Geomorphology iv. Process Geomorphology	12
2	Tectonism and Geomorphology a) Interior of the Earth. Sources of Knowledge i. Inferred Knowledge (Density, Temperature, Pressure) ii. Surface Expressions (Seismic Wave Evidences) Holmes Convection Current Theory iii. Rocks – Igneous, Metamorphic and Sedimentary rocks. b) Isostasy c) Wegener’s Continental Drift Theory d) Plate Tectonics and Sea Floor Spreading e) Endogenic Forces	12
3	Landforms Development: a) Models of landscape evolution, Slope forms, processes, classification and development: Ideas of Davis, Penck, and King. b) Multicyclic and polygenetic evolution of landscapes. c) Dynamics of fluvial, glacial, Aeolian, Costal and Karst cycle process and resulting landforms.	12
4	Geomorphologic Process a) Denudational Processes. i. Weathering ii. Mass Movement iii. Erosion iv. Definitions and Comparison of these processes b) Weathering and Mass movement i. Types of Weathering ii. Types of Mass Movement	12
5	Applied Geomorphology: a) Geohydrology b) Geomorphic hazards and mitigation	12

c) Geomorphology and Soils d) Geomorphology and mining e) Geomorphology in mineral, Groundwater prospecting and watershed management. f) Application of geomorphic mapping <ul style="list-style-type: none"> i. Urban geomorphology ii. Regional geomorphology (with reference to Khandesh Region) iii. Terrain evaluation, classification and its applications iv. Oil exploitation 	
Total Periods	60

Reference Books

1. **Thornbury, W.D. (1960):** Principles of Geomorphology”, John Wiley and Sons, New York
2. **Chorley R. J, Schumm, S.A. and Sugden D.E. (1984):** Geomorphology, Methuen, London.
3. **Kale V.S and Gupta, A (2001):** Introduction to Geomorphology, Orient Longman, Calcutta.
4. **Savindra Singh (2002):** Geomorphology, Prayag Pustak Bhawan, Allahabad.
5. **Spark B.W. (1972):** Geomorphology, Longman, New York.
6. **Steers A. (1958):** The Unstable Earth, Methuen, London.
7. **Ollier, C.D. (1981):** Tectonics and Landforms, Longman, London.
8. **Strahler A.H. and Strahler, A.N. (1998):** Introducing Physical Geography, John Wiley and Sons, Inc. New York.
9. **Wooldridge and Morgan:** Geomorphology, Longman, New York.
10. **Holmes:** Physical geology,
11. **Fairbridge, R.W. (1968):** Encyclopedia of Geomorphology, Reinholdts, New York.
12. **K. Siddhartha (2001):** The Earth’s Dynamic Surface, Kisalaya Publications Pvt. Ltd.
13. **Savindra Singh:** Physical Geography, Prayag Pustak Bhawan, Allahabad.
14. **Strahler, A. N. (1965):** Introduction to Physical Geography, Wiley, New York.
15. **James G. Edinger :** Environment.

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M.A. /M.Sc. APPLIED GEOGRAPHY
SYLLABUS
Semester I
(w. e .f. June 2013-14)
Gg. 102: ENVIRONMENTAL GEOSCIENCES

Unit No.	Title	Periods
1	<p>Basic issues in environmental sciences:</p> <ul style="list-style-type: none"> a) Definition, principles and scope of environmental science. b) Components of environment c) Geography and environment d) Man and nature, Environment and resources e) Man – Environment Relationships: <ul style="list-style-type: none"> i. Approaches to the study ii. Environmental deterministic approach iii. Teleological approach iv. Possibilistic approach v. Economic deterministic approach vi. Ecological approach f) Environment and man; Man’s interaction with the environment. 	12
2	<p>Ecological systems:</p> <ul style="list-style-type: none"> a) Ecological concepts <ul style="list-style-type: none"> i. Meaning and definitions ii. Ecosystem concepts and Components b) Ecosystem – form and functions <ul style="list-style-type: none"> i. Food chain ii. Food web iii. Tropic level iv. Ecological niche. c) Biosphere and Ecosystem <ul style="list-style-type: none"> i. Material circulation through ecosystem ii. Natural system and man induced changes – iii. Energy cycle iv. Hydrological cycle v. Nutrient cycle (carbon, nitrogen, phosphorous) 	12
3	<p>Environmental Degradation:</p> <ul style="list-style-type: none"> a) Concepts and types of environmental degradation b) Causes of environmental degradation c) population growth and development, urbanization, land degradation. d) Environmental Pollution <ul style="list-style-type: none"> i. Sources and types of pollution ii. Air pollution, adverse effects of air pollution on weather and climate-ozone depletion 	12

	<ul style="list-style-type: none"> iii. Green house effect iv. Effects on human health v. Water pollution vi. Surface and ground water vii. Adverse effects on human health. 	
4	<p>Environmental Hazards:</p> <ul style="list-style-type: none"> a) Meaning and concepts b) Earthquake disaster <ul style="list-style-type: none"> i. Adverse effects ii. Earthquake hazards in India iii. Management of earthquake disaster c) Tropical Cyclones <ul style="list-style-type: none"> i. Adverse effects ii. Cyclones in India iii. Management of cyclonic disaster d) Floods causes <ul style="list-style-type: none"> i. Flood disaster in India ii. Management of floods. e) Environmental Planning and Management <ul style="list-style-type: none"> i. Environmental management: methods and approaches ii. Ecological basis of environmental management iii. Ecological principles; Survey, evaluation, preservation and Conservation of resources. 	12
5	<p>Biogeography: Meaning, Nature, Scope, significance, approaches, history, recent developments.</p> <ul style="list-style-type: none"> a) Spatial dimension in biogeography <ul style="list-style-type: none"> i. Pattern and causes of plant and animal distributions ii. Factors influencing the distribution of life iii. Bio-geographical regions and realms b) Historical biogeography c) Patterns of life in the past and today d) Biodiversity <ul style="list-style-type: none"> i. Concept ii. Recent trends and future possibilities iii. Biodiversity and the source of novelty in life. 	12
Total Periods		60

Reference Books

1. **Daniel Botkin and Edward Keller (1997):** Environmental Sciences, John Wiley and Sons, New York
2. **Eldon D. Enger and Bradley F. Smith (1995):** Environmental Science, WCB Publishers, Boston.

3. **Dr. A. K. Jain (1989):** Forests in India, Vorha Publication, Allahabad.
4. **Nileema Rajvaidya (1989):** Advances of Environmental Science and Technology, APH Publishing House, Delhi)
5. **Soil Sciences (1997):** T.D. Bishwas & S. K. Mukharji, , Tata Mc-graw hill pub.Co. Ltd. New Delhi.
6. **Environmental Awareness (1998):** Chandna, R.C., , , Kalyani Publishers, New Delhi.
7. **Global Environmental Crisis (2006):** Gaur, S., and Chandrashekhar, T., Book Enclave, Jaipur.
8. **Environmental Issues for the 21st Century (2003):** Gupta, P.D., Mittal Publications, New Delhi.
9. **Changing Environments (2003):** Morris, D., Freeland, J., Hinchliff, S., Smith, S., John Wiley and Sons Ltd., The Open University, U.K.
10. **Ecology and Environmental Management Park (1980):** C.C. Butterworths, London.
11. **Environmental Challenges of the 21st Century (2004):** Radha, S., and Sankhyan, A.S., Deep Publications, New Delhi.
12. **Environment and Sustainable Development (2007):** Rasure, K.A., , , Serials Publications, New Delhi.
13. **Environmental Studies (2006):** Saxena, H.M., Rawat Publications, Jaipur.
14. **Environmental Geography (1991):** Singh, S., Prayag Publication, Allahabad.
15. **Geography and Man's Environment (1997):** Strahler, A.N., and Strahler, A.M., , , John Wiley and Sons, New York.
16. **Environmental Impact Assessment, An Indo – Australian Perspective (2007):** Taj, B., Murphy, P. and Rana, P.S., Bookwell New Delhi.
17. **Environmental Protection and Development (2005):** Verma, S. B. and Shiva, K.S., Deep Publications, New Delhi

KAVAYITRI BAHINABAI CHAUDHARI
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M.A. /M.Sc. APPLIED GEOGRAPHY
SYLLABUS
Semester I
(w. e .f. June 2013-14)

Gg. 103: FUNDAMENTAL OF CARTOGRAPHY

Unit No.	Title	Periods
1	<p>Fundamental of Cartography:</p> <p>a) Definition, Nature, Scope, History, Types, Developments</p> <p>b) Significance</p> <p>c) Advance Cartographic techniques</p> <p>d) Application of cartography.</p>	12
2	<p>Qualitative Cartography:</p> <p>a) Map</p> <p style="padding-left: 20px;">i. Definition</p> <p style="padding-left: 20px;">ii. Elements</p> <p style="padding-left: 20px;">iii. Types</p> <p style="padding-left: 20px;">iv. Characteristics</p> <p style="padding-left: 20px;">v. Map Making Methods.</p> <p>b) Scale</p> <p style="padding-left: 20px;">i. Definition</p> <p style="padding-left: 20px;">ii. Types of Scale, Presentation Techniques & Conversion of Scale</p> <p style="padding-left: 20px;">iii. Characteristics</p> <p style="padding-left: 20px;">iv. Scaling Methods & Uses.</p> <p>c) Relief:</p> <p style="padding-left: 20px;">i. Definition</p> <p style="padding-left: 20px;">ii. Types</p> <p style="padding-left: 20px;">iii. Characteristics</p> <p style="padding-left: 20px;">iv. Relief Presentation Techniques: hachure's, shading, contours and layer tints)& Uses.</p> <p>d) Profiles:</p> <p style="padding-left: 20px;">i. Definition</p> <p style="padding-left: 20px;">ii. Types</p> <p style="padding-left: 20px;">iii. Characteristics</p> <p style="padding-left: 20px;">iv. Drawing of profiles</p> <p style="padding-left: 20px;">v. Significance.</p> <p>e) Gradient & Slope</p> <p style="padding-left: 20px;">i. Definition</p> <p style="padding-left: 20px;">ii. Types</p> <p style="padding-left: 20px;">iii. Characteristics</p> <p style="padding-left: 20px;">iv. Slope analysis methods</p>	12

	v. Significance.	
3	Quantitative Cartography: a) Representation of numerical data : i) line graphs ii) bar graphs iii) Proportional Circle iv) Divided Circle v) Histogram vi) Thematic Mapping- Choropleth and Isopleths b) Methods of Area Measurement c) Methods of Map enlargement and reduction	12
4	Computer Cartography: a) Fundamentals of computer cartography i. Digital cartography ii. History iii. Developments and advantages of computerize cartography. b) Representation of geographic data with the help of Advance Techniques: CAD, GIS and GPS	12
5	Map Interpretation Techniques: a) Study of Survey of Indian topographical maps i. Classification scale and Indexing of Toposheets ii. Introduction to SOI topographical maps: numbering, scales and grid reference, signs and symbols, color system, etc. b) Interpretation of SOI maps i. Hilly, Mountainous, Plain, Desert, Coastal Areas c) Interpretation of Foreign Toposheets i. Ordnance Survey Map of UK ii) Geological Survey of USA.	12
Total Periods		60

Reference Books:

1. **Geographical Information Systems - Principles and Application (1991):** Maquire, D.J., Good Child, M.F. and Rhind, D.W., Taylor and Francis Publication Washington,.
2. **Geographical Information System (1991):** Fraser Taylor, Pergmon Press, U.K.
3. **Digital Cartography (1992):** Cromley, R.G., Prentice Hall, New Jersey.
4. **Computer Assisted Cartography: Principles and Prospects (1982):** Monmonier, M. S., Prentice Hall, New Jersey.
5. **Introductory Cartography (1984):** Campbell, J., Prentice Hall, Inc., Englewood Cliff, New Jersey.
6. **Elements of Cartography (New edition):** Robinson, A.H., John Willey and Sons, New York.
7. **National Atlas and Thematic Maps Organization (NATMO):** National Atlas of India Calcutta.
8. **Field Techniques and Research Methods in Geography (1982):** Glodard R. H., Dubuque.
9. **Statistical Methods in Geographical Studied (1977):** Mahmood A., Rajesh Publication, Delhi.

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Semester I
(w. e .f. June 2013-14)

Gg. 104: PRACTICALS IN PHYSICAL GEOGRAPHY

Unit No.	Title	Periods
1	<p>Drainage Network Hierarchy:</p> <p>a) Drainage network hierarchy</p> <p style="padding-left: 20px;">i) Horton’s method</p> <p style="padding-left: 20px;">ii) Strahler’s method</p> <p>b) Laws of drainage composition</p> <p>I) Law of stream order :</p> <p style="padding-left: 20px;">i) Measurement of order wise stream number</p> <p style="padding-left: 20px;">ii) Stream number v/s Stream order. (Preparation of graph)</p> <p style="padding-left: 20px;">iii) Bifurcation ratio</p> <p>II) Law of stream length</p> <p style="padding-left: 20px;">i) Measurement of stream length and average.</p> <p style="padding-left: 20px;">ii) Stream order v/s average stream length. (Preparation of graph)</p> <p style="padding-left: 20px;">iii) Length Ratio</p>	12
2	<p>Measurement of catchment area of drainage basin unit:</p> <p>i) Drainage Frequency</p> <p>ii) Drainage Density</p> <p>iii) Constant of Channel Maintenance</p> <p>iv) Basin Elongation</p> <p>vi) Ruggedness Number</p> <p>vii) Stream order v/s mean area Interpretation of the results of all sub units.</p>	12
3	<p>Relief and Slope Analysis:</p> <p>a) Absolute Relief Map</p> <p>b) Relative Relief Map</p> <p>c) Dissection Index Map</p> <p>d) Hypsometric Integral</p> <p>e) Miller’s Isotan Map</p> <p>d) Slope Map by Wentworth’s Method</p>	12
4	<p>Geological Maps:</p> <p>a) Introduction of Geological Maps:</p> <p style="padding-left: 20px;">i) Dip</p> <p style="padding-left: 20px;">ii) Strike Line</p> <p style="padding-left: 20px;">iii) Bedding Plane</p> <p style="padding-left: 20px;">iv) Plane of Unconformity</p>	12

	v) Out Crop b) Drawing of Geological Section and its Interpretation. (Three Maps)	
5	Sediment Analysis: a) Sieving and pipette method- i) Analysis of 1 sandy and 1 Clayey sample ii) Plotting of data on probability graph paper and estimation of grain size parameters. iii) Interpretation of processes. b) Study of Sedimentary sequences and weathering profile- i) Study of 1 sedimentary sequence of river or costal sediments and 1 weathering profiles. ii) Interpretation in terms of past and present processes,	12
Total Periods		60

Reference Books

1. **Physical Geography:** Strahler A.N.
2. **Elements of Practical Geography (1968):** R. L. Singh & Dutt P. K., Student's Friend, Allahabad
3. **Elements of Climatology:** G. T. Triwartha.
4. **Maps & Diagrams (1976):** Monkhouse F.J., Wilkuison H.R, Methune & Co. London.
5. **Techniques in Geomorphology (1966):** King C.A.M., Edward Arnold, London.
6. **Climatology Fundamental & Application:** Mathur.
7. **The Skin of the Earth (1953):** Miller Austin, Methune & Co. Ltd London.
8. **Drainage Basin Forms & Process:** Gragory K. J. & Walling D.
9. **National Informatics Centre.**
10. **Geomorphology (1986):** Hart, M. G., Unwin Hyman, London.
11. **Geomorphological Techniques (1990):** Goudie, A., Unwin Hyman, London.
12. **Techniques in Geomorphology (1966):** King, C.A.M., Edward Arnold, London.
13. **Geomorphological Field Manual ((1983):** Aackombe, R. V. and Gardiner, V., George Allen and Unwin, London
14. **Geomorphology (1984):** Chorley, R. J., Schumm, S. A. & Sugden, D.E., Methuen, London
15. **Introduction to Geomorphology (2001):** Kale, V. S. and Gupta, A., Orient Longman, Calcutta

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Semester I
(w.e.f. June 2013-14)

Gg. 105: CARTOGRAPHIC TECHNIQUES WITH HELP OF GIS

Unit No.	Title	Periods
1	Fundamental of Cartography: a) Advance Cartographic techniques & Application.	12
2	Introduction to GIS Software: Interface, Menu bar, Toolbar, Data import, Scale, factor, Layer Properties, Drawing cleanup, Topology Building, Digitization, Layout, Safe file.	12
3	a) Cartographic Techniques with the help of GIS: Techniques to Prepare Following Maps- 1. Choropleth Map: i) Shading ii) Colour 2. Dot Map 3. Transformation of Dot map into Isopleth Map 4. Proportional Circle Map: 2D and 3D b) Cartographic Techniques in Population Geography: Preparation of Following Maps: 1. Density of Population 2. Concentration of Population 3. Sex Ratios 4. Proportion of Category Wise Population 5. Religion wise composition 6. Literacy Rate	12
4	a) Cartographic Techniques in Rural Settlement Geography 1. Classification of Rural Settlements according to size of Population 2. Proportion of Rural Population 3. Dispersion of Settlements b) Cartographic Techniques in Population Geography 1. Classification of Towns according to size of Urban Settlement 2. Proportion of Urban Population 3. Degree of Urbanization 4. Functional Classification of Towns c) Cartographic Techniques in Agricultural Geography 1. Proportion of Crops 2. Crop Concentration 3. Crop Diversification 4. Crop Combination 5. Land use and Land Classification	12
5	2. Excursion:	12

	<p>a) Visit to a place or a region of geographical interest.</p> <p>b) Report should include the following points:</p> <p>i) Land forms- More emphasis should be given on the formation of the land forms.</p> <p>ii) Economy</p> <p>iii) Settlements</p> <p>vi) Transport</p> <p>v) General Observations. While writing the report students may write report on any one point or may consider all points.</p> <p>c) Maps Photographs & Diagrams are necessary in the report.</p> <p>d) Collection of rock specimens is also expected. Students should bring them at the time of examination & show them to the examiner. Examiners are requested to give weightage to such students.</p>	
Total Periods		60

Reference Books:

1. **Statistic for Geography and Social Science:** R. B. Mandal.
2. **Maps and Diagram:** Monkhouse.
- 3) **Agricultural Geography:** Majid Hussen.
- 4) **Geography of Settlement (1976):** Hudson F.S.
- 5) **An Introduction to Quantitative Analysis in Human Geography (1974):** Yeats M.H.
- 6) **Agricultural Geography (1984):** Sing J. and Dhillon.
- 7) **Readings in Rural Settlement Geography:** Sing R.L.
- 8) **Transportation Geography:** Michael E. and E. Hurse.
- 9) **The Study of Urban Geography:** Edward Arnold.
- 10) **Mastering Auto CAD:** George Omura, BPB Publication, B14 Connaught place, New Delhi

**KAVAYITRI BAHINABAI CHAUDHARI
NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.A. / M.Sc. APPLIED GEOGRAPHY**

**SEMESTER II
W. E. F. JUNE 2018-19**

Semester II

- Gg. 201: Fundamental of Human Geography.
- Gg. 202: Climatology & Oceanography.
- Gg. 203: Geo-Statistics & Research Methodology.
- Gg. 204: Practical's in Human Geography
- Gg. 205: Practical's in Climatology and Oceanography.
- Gg. 206: Tutorials - II

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SYLLABUS
Semester II
(w.e.f. June 2018-19)

Gg. 201: Fundamental of Human Geography.

Unit No.	Title	Periods
1	<p>Introduction of Human Geography: Introduction to basic concepts in human geography, Approaches, scope, nature, branches and significance of the study of human Geography</p>	12
2	<p>Population Geography: Nature, scope, significance and historical development, and its Relationship with demography and population studies.</p> <p>a) Sources of Population Data, b) Population distribution, growth and determinants: c) Theories of Growth: Biological - Malthus; Volitional-Social capillarity, demographic transition and regulation. d) Population Dynamics: brief history, trends and patterns. measurement, determinants and distributions – i) Fertility, ii) Mortality, and iii) Migration: Brief History, trends and patterns. Developed world and Developing world model, Migration in India. e) Population Regions: Typology of population regions, Ackerman scheme of population resource region. f) Population policy of India.</p>	12
3	<p>Settlement Geography:</p> <p>a) Conceptual framework: Significance and scope of settlement geography; development of settlement geography, methodological advances in the study of settlement geography; approaches to the study of settlements: evolutionary, spatial, and ecological; types of settlement.</p> <p>b) Rural settlements: definition and characteristics. The evolution of field boundaries and field patterns, site and situations. Types and materials of farm fencing; folk housing and folk architecture; traditional building materials.</p> <p>c) Urban settlements: site and situation; size and spacing of urban settlements; theory of Christaller; functional classification of urban centers harris and nelson; morphological characteristics of urban</p>	12

	<p>settlements; theories explaining internal structure of cities: sector, Concentric zone and multiple-nuclei.</p> <p>c) Settlement in India: Indian village, nature and characteristics; a model of Indian village by spate; study of rural settlements in India with special reference to their morphological characteristics; approaches to the morphogenesis of Indian villages. Orientation and segregation of castes in villages; dichotomy in built environment: Mohammad Habib and Budha Prakash debate.</p>	
4	<p>Medical Geography:</p> <p>a) Concepts, Nature, Scope & Significance of Medical Geography, Approaches to the Study of Medical Geography: Ecological, Social and Spatial.</p> <p>b) Approaches to the Study of Wellbeing: Need-based, Relative Standard and Capability; Geographical Factors affecting Human Health and Wellbeing.</p> <p>c) Diseases and their Typology: WHO Classification of Diseases and their Major Types: Genetic; Communicable and Non-communicable; Occupational and Deficiency Diseases; Epidemics and Pandemic.</p> <p>d) Global Patterns of Human Health Ecology, Etiology, Diffusion and Distribution Pattern of Malaria, Tuberculosis, Hepatitis, AIDS, Glycemia and Cardiovascular Diseases; Poverty; Food Security; Nutrition Deficiency; Health and Sanitation Facilities.</p> <p>e) National concerns, new developments, Indian Health Care Planning: Child and Family Health Welfare, Immunization, Rural Health, National Health Care Infrastructure; Health GIS.</p>	12
5	<p>Socio-Cultural Geography:</p> <p>a) Fundamental concepts: Definition, scope; Concepts of social space, social area analysis and social wellbeing. Development of social geography in India.</p> <p>b) Patterns and processes: World distribution of religious and linguistic groups. Cultural realm and their distribution. Process and problems of social change in the traditional societies.</p> <p>c) Social structure of India: Distribution of racial and linguistic groups of India. Distribution of various socially backward groups and their socio-economic issues. Regional imbalances with- reference to literacy, health, poverty and crimes in India. Human Development Index.</p> <p>d) Social issues in India: Unity in diversity. Regional consciousness and national integration. Social conflicts and violence. Emphasis of social planning during XIth and XIIth five-year plans. Concept of Culture; Meaning and scope of cultural geography; Processes of Cultural evolution; Cultural changes--perception, behaviorism and cultural relativism; Major concepts--cultural diffusion, material culture, cultural landscape, cultural ecology, acculturation.</p>	12

	<p>e) behaviorism and cultural relativism; Major concepts--cultural diffusion, material culture, cultural landscape, cultural ecology, acculturation.</p> <p>f) Origin and dispersal of man; Cultural hearths; Primitive culture; Agricultural practices, agricultural innovations; industrial and technological revolution; globalization and cultural development, cultural conflict.</p> <p>g) Origin and dispersal of human races; zone-strata theory; Racial composition of India, Major religions of the world; Religion and economic development; Major linguistic families; world distribution of major languages; Religious composition of India.</p> <p>h) Environment and Culture; environmental perception; Resources and culture; space adjustment and space intensification; major cultural realms of the world; Major cultural regions of the world.</p>	
Total Periods		60

Reference Books

1. Chandna, R.C. : A Geography of Population, Jallundhar, 2002.
2. Sundaram, K.V. & Nangia, S. (Eds.) Population Geography, Delhi, 1995.
3. Khan, J.H. Scio-Economic & Structural Analysis of Internal Migration, New D. 2010.
4. Siddiqui, F.A, Regional Analysis of Population Structures; ND, 1984.
5. Trewartha, G.T., A Geography of Population: World Patterns, NY. 1969.
6. Mitra, A., India's Population, Vols. I, II, Abhinav Pub., N.D., 1979.
7. Ahmad, E. 1979. Social and Geographical Aspects of Geography of Human Settlements. New Delhi: Classical Publications.
8. Census of India, 2001, 2011 - House Types and Settlement Patterns of Villages in India. New Delhi.
9. Christaller, C. W. 1966. Central Places in Southern Germany. Englewood Cliffs N. J: Prentice Hall.
10. Cox, K. R. 1972. Man, Location and Behavior: An Introduction to Human Geography. New York: John Wiley and Sons.
11. Eidt, R. C., K. N. Singh, and R. P. B. Singh, 1977. Man, Culture and Settlement. Varanasi: Kalyani Publishers.
12. Mukerji, A. B. 1976. Rural Settlements of the Chandigarh Siwalik Hills (India): A Morphogenetic Analysis. Geografiska Annaler, 58(2): 95-115.
13. Mukerji, A. B. 1984. Progress in Rural Settlement Geography. In A Survey of Research in Geography 1972 – 75. New Delhi: Concept Publishing Company.
14. Singh, J. P. and Khan, M. 2002. Mystical Space, Cosmology and Landscape: Towards a Cultural Geography of India. New Delhi: Manak Publication.
15. Singh, R. L. and K. N. Singh (eds.) 1975. Readings in Rural Settlement Geography. Varanasi: The National Geographical Society of India, B. H. U.
16. Cliff, A. & Haggett, P. (1989). Atlas of Disease Distribution, Basil Blackwell, Oxford.
17. Fouberg, E.H., Murphy, A.B., H. J. de Blij.(2009). Human Geography: People, Place, and Culture, Wiley and Sons, Eagle Lake.

18. Hazara, J. (ed) (1997). Health Care Planning in Developing Countries, University of Calcutta, Kolkata.
19. May, J.M. (1970). The World Atlas of Diseases, National Book Trust, New Delhi.
20. Narayan, K.V. (1997). Health and Development: Inter-sectoral linkages in India, Rawat Pub., Jaipur.
21. Rais,A. and Learmonth, A.T.A., (1986). Geographical Aspects of Health and Diseases in India, Cocept Publishing Company, New Delhi.
22. Izhar,N. (2004). Geography and Health; A study in Medical Geography, Saujanya Books, Delhi.
23. http://en.wikipedia.org/wiki/Health_geography
24. <http://www.esri.com/industries/health/geomedicine/index.html>
25. J.E.Spencer and W.L. Thomas: Introducing Cultural Geography John Willey and Sons, New York, 1973.
26. J. M. Broek: Geography of Mankind, Mc.Graw Hill, New York.
27. Husain, M., 2000, Human Geography, New Delhi.
28. Khan, J.H. Scio-Economic & Structural Analysis of Internal Migration, N. D. 2010.
29. Dicken, S.N., Introduction to Human Geography.
30. Spencer, J.E. & Thomas, W.L., 1978, Introduction to Cultural Geography, New York.

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Semester II
(w. e .f. June 2018-19)

Gg. 202: Climatology & Oceanography.

Unit No.	Title	Periods
1	Introduction to Climatology: Nature, Scope, Approaches and Branches of climatology, its relationship with meteorology, Modern trend and techniques in meteorology and Climatology, Application of Climatology.	10
2	Atmosphere: a) Structure, composition and characteristics of atmosphere. b) Insolation - Heat balance of the earth, Green House effect. c) Elements of Climate: i) Temperature - Distribution of temperature: Temporal, vertical and horizontal ii) Air-Pressure - Distribution of atmospheric pressure and winds iii) Humidity - Atmospheric Equilibrium: Stability and instability, potential temperature and evapo-transpiration. v) Wind - planetary, local and monsoon winds, its characteristics vi) Precipitation - hydrologic cycle; formation and types of precipitation; global and regional distribution of precipitation.	12
3	1) Climatic Phenomena: a) Air masses and fronts, origin, growth, classification. b) Frontogenesis, types and weather associated with fronts. c) Jet streams - their origin, types and distribution. d) Cyclones and anticyclones, e) Global warming, climate change.	07
	2) Climatic Classifications: a) Koppen's Classification- A critical appraisal of each Classification, b) b)Thornthwaites Classification - A critical appraisal of each Classification, c) Climates of the World: Tropical, Temperate, Deserts. d) Interpretation and generation of climatic information, soils, agricultural activities.	07

4	<p>Oceanography: Nature, scope, approaches, branches, significance and recent development in oceanography. a) Global Distribution of land and water. b) Ocean bottom topography. c) Bottom relief: i) Pacific, ii) Atlantic and iii) Indian Ocean, iv) Arctic Ocean. d) Characteristics of Ocean water: i) Temperature – Global Distribution, ii) Salinity – composition, source and distribution, iii) Density of sea level. e) Movement of ocean water: Ocean currents - causes and character, Ocean currents of Atlantic, Indian and Pacific Ocean, f) Sea Waves, tides and theories of origin. g) Ocean deposits: sources, types and distribution of ocean deposits, i) Coral reefs – formation, favorable condition of growth, type and theories of origin.</p>	12
5	<p>Applied Climatology: History, development, importance. Weather Analysis: Data Acquisition and Dissemination. Weather Forecasting: Methods, Types, Accuracy. Medium Range Forecasts, Long Range Forecasts. Satellites in Weather Forecasting. Relationship between Climate and Ocean, El-Nino, La-Nino, Climatic Change: Definition and Detection: Seafloor Sediment, Glacial Ice, Tree Rings, And Oxygen Isotope – Analysis. Natural Causes of Climate Change: Plate Tectonics, Volcanic Activity, Orbital Variations, Solar Variability, Anthropogenic causes of global climate change.</p>	12
Total Periods		60

Reference Books

1. Barry, R.G. & Chorley, R.J., Atmosphere, Weather and Climate, Methuen Co. Ltd., London, 5th Edition, 1987.
2. Bhutani, Smita, Our Atmosphere, Kalyani Publishers, Ludhiana, 2000.
3. Critchfield, H.J., General Climatology, Prentice Hall, N.J., 1975.
4. Frederick K. and Edward J. Tarbuck, The Atmosphere: An Introduction to Meteorology, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
5. Strahler, A.N., Modern Physical Geography, John Wiley and Sons, New York, Singapore, 1987.
6. Trewartha, G.T., An Introduction to Climate, McGraw Hill, New York, 1980, Fifth Edition (International Student Edition).
7. Thompson Russell D., Applied Climatology - Principles & Practice, John Willey, New York, 1997.
8. Barry & Perry., Synoptic Climatology.
9. Blair, T.A., Climatology-General and Regional.
10. Chorley, R.J. & Barry, R.G., Atmospheric Weather and climate.
11. Donn, W.L., Meteorology.
12. Jackson, I.J., Climate, Water and Agriculture in the Tropics, 1977.
13. Kendrew, W.G., Climates of the Continents.
14. Lal, D.S., Climatology.

15. Mather, J.R., Climatology: Fundamental and Applications, 1974.
16. Patterson., Introduction to Meteorology.
15. Stringer., Foundation of Climatology.
16. Stringer., Techniques in Climatology.
17. Trewartha, G.T., An Introduction to Climate.
18. Davis, R.J.A. 1986, Oceanography – An Introduction of the Marine Environment, Win C. Brown, Iowa.
19. Siddhartha, K. 1999, Oceanography, A Brief Introduction, Kisalaya Pub. Pvt. Ltd., New Delhi.
20. Singh, S. 2002, Physical Geography, Prayag Pub., Allahabad.
21. Strahler, A. N. Strahler A.M., 1997, Geography and man's Environment, John Wiley And Sons, New York.
22. Thurnman, H.V., 1978, Introduction to oceanography, Charles E. Merrill Pub. Co., London.
23. Weyl, P.K. 1970, Oceanography an Introduction of the Marine Environment, John Wiley and Sons Ltd., London.

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 Semester II
 (w. e .f. June 2018-19)
Gg. 203: Geo-Statistics & Research Methodology.

Unit No.	Title	Periods
1	<p>Introduction:</p> <ol style="list-style-type: none"> 1. Geo-Science System and Statistical technique 2. Characteristics of data – Units of expression of data. <ol style="list-style-type: none"> a) Nominal b) Ordinal c) Interval d) Ratio <p>Probability Assessments :</p> <ol style="list-style-type: none"> a) Probability and Normal Probability distribution – Normal distribution function Critical Value – Mean Value $Z \text{ (deviate Score)} = \frac{\text{Critical Value} - \text{Mean Value}}{\text{Standard Deviation}}$ b) Binomial distribution <ol style="list-style-type: none"> 1) Binomial distribution function 2) Characteristics of Binomial distribution. c) Poisson Distribution <ol style="list-style-type: none"> 1) Poisson Distribution function 2) Characteristics, Merits and demerits 	10
2	<p>A) Sampling and Sampling Plan in Geo-Science System:</p> <ol style="list-style-type: none"> 1. Population and Sample 2. Types Sampling: <ol style="list-style-type: none"> i) Simple Random Sampling: Point, Area and Line Sampling ii) Restricted Random Sampling Systematic, Grid and Stratified. <p>B) Designing and conducting a Sample Survey:</p> <ol style="list-style-type: none"> 1. Planning 2. Data Collection 3. Data analysis and Conclusions. 	12
3	<p>A) Parametric Statistics in Geo-Science System:</p> <ol style="list-style-type: none"> 1) Sampling theory and Parametric Statistics. 2) Null-Hypothesis and significance level 3) One tailed and two tailed tests 4) Test of Significance between sample mean and population mean. <p>B) Parametric Statistics in geo-science system: (Small sized sample)</p> <ol style="list-style-type: none"> 1) Student's 'T' Statistics 2) Test of significance between sample mean and population mean (when standard deviation is unknown) 3) F – Distribution (Analysis of Variance) <p>C) Non Parametric Statistics in geo-science system:</p>	14

	1) Chi-Square Test- One Sample Test, 2) K-S Test-One-Sample.	
4	Research Methodology: 1) Meaning and objectives of research; research types; significance of research; research process. 2) Research problem: Selection and techniques. Research Design, meaning, need and features of a good design. 3) Measurements in research, scales; techniques of developing measurement tools.	12
5	Data collection and Presentation: 1) Data collection, Methods, Preparation of questionnaires and schedules. Surveys and experiments. Processing and Analysis of data, statistics in research. 2) Hypotheses Formulation & Testing. 3) Interpretation and Report Writing.	12
Total Periods		60

Reference Books:

1. Maquire, D.J., Good Child, M.F. and Rhind, D.W.: Geographical Information Systems: Principles and Application, Taylor and Francis Publication Washington,1991.
2. Fraser Taylor : Geographical Information System, Pergmon Press, U.K.,1991.
3. Cromley, R.G.: Digital Cartography, Prentice Hall, N. Jersey, 1992.
4. Monmonier, M. S.: Computer Assisted Cartography: Principles and Prospects, Prentice Hall, New Jersey, 1982
5. Campbell, J., Introductory Cartography, Prentice Hall, Inc., Englewood Cliff, New Jersey, 1984.
6. Robinson, A.H.: Elements of Cartography, John Willey and Sons, New York (New edition).
7. National Atlas and Thematic Maps Organization (NATMO): National Atlas of India Calcutta.
8. Glodard R. H.: Field Techniques and Research Methods in Geography, Dubuque 1982.
9. Mahmood A.: Statistical Methods in Geographical Studied, Rajesh Publication, Delhi, 1977.

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(w. e .f. June 2018-19)

Gg. 204: Practical's in Human Geography

Unit No.	Title	Periods
1	<p>Introduction to Microsoft Excel Work Book and Presentation Techniques:</p> <p>A) Microsoft Excel:</p> <p>(a) Worksheets Workbooks & Worksheets. (b) Data Analysis tools and Techniques: (c) Development of Syntax on Formula Bar: (d) Data Presentation Techniques</p> <p>B) Presentation Techniques:</p> <p>(a) Introduction to Microsoft Office Power Point (b) Preparation of Slides (c) Maps and Graphs import techniques for slide show</p>	12
2	<p>Data Analysis Techniques in Population Geography:</p> <p>A) Density:</p> <p>a) Arithmetic Density of Population b) Economic Density of Population c) Nutritional Density of Population d) Agricultural Density of Population e) Critical Density of Population</p> <p>B) Measures:</p> <p>a) Fertility Rates b) Birth Rates: Crude & Age Specific c) Mortality Rate d) Child-Women Ratio</p> <p>C) Sex Ratio: Sex Ratio of all groups of Population D) Population Change: Annual or Decadal E) Dependency Ratio: F) Religious Composition:</p>	12
3	<p>Data Analysis Techniques in Rural And Urban Settlement Geography:</p> <p>A) Dispersion of Rural Settlements:</p> <p>a) Bernhard's method b) Demangeon method c) Debouvrie's method</p> <p>B) Classification of Villages according to size of Population C) Growth Rate of Rural Population D) Growth of Urban Population E) Degree of Urbanization F) Functional Classification of Towns by Thompson</p>	12

	G) Centrality Index by Christaller	
4	Data Analysis Techniques in Agricultural Geography and Statistical Techniques: A) Proportion of Cropped Land B) Crop Concentration by Bhatia C) Crop Diversification by Bhatia D) Crop Combination by Weaver's & Doi's Methods. E) Correlation of Coefficient F) Quartile Deviation G) Standard Deviation H) Coefficient of Variation I) Calculation of 'r' values to draw circles	12
5	Field Work: Data Collection & Village Report Writing- Census Data Collection: A) Prepare census questionnaires as per the Govt. census survey B) A group of five students should select one Village. Students should collect Census Data through personal interview of villagers to fill up the questionnaires. C) Every group of students should take interview of at least 50 villagers. Report Writing Method: A) Research Methodology B) Data Analysis Techniques: Students Should analyze data by using techniques given in the syllabus. A) Data Presentation Techniques B) Concluding remarks C) References & Bibliography Report: Group of five students will prepare a separate census report. They will submit hard and soft copy of census report at the time of examination. Students should present report with the help of Power Point. (At least 10 slides)	12
Total Periods		60

Reference Books

1. R.B.Mandal: "Statistic for Geography and Social Science".
2. Monkhouse: "Maps and Diagram".
- 3) Masjid Husen ":Agricultural Geography".
- 4) Hudson F.S.(1976): "Geography of Settlement" .
- 5) Yeats, M.H. (1974): "An Introduction to Quantitative Analysis in Human Geography".
- 6) Sing J. and Dhillon (1984) "Agricultural Geography".
- 7) Sing R.L. " Readings in Rural Settlement Geography".
- 8) Michael E. and E. Hurse: 'Transportation Geography".
- 9) Edward Arnold: "The Study of Urban Geography".
- 10) George Omura: Mastering Auto CAD, BPB Publication, b14 Connautplace, New Delhi
- 11) Grini Courter and Annette Marquis (1999): "OFFICE 2000" BPB Publication.

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Gg. 205: Practical's in Climatology and Oceanography.

Unit No.	Title	Periods
1	Weather Elements: a) Processing of weather data: Instrumentation and measurement techniques of weather elements and processing of weather data (5-10 years data)	12
2	Water balance - Principle and computation: Computation of water balance for 4 stations in different rainfall zones and irrigation scheduling	12
3	Preparation of Climatic Maps & Diagrams: (data based on metric system should be used) i) Simple temperature and rainfall graph, ii) Climatograph iii) Climograph, iv) Hythergraph, v) Foster's Climograph vi) Wind Roses : Simple, Compound & Octagonal vii) Rainfall Dispersion.	12
4	Station Model: a) Preparation of Station Model: i) Synoptic data: Coding, decoding and plotting of synoptic data. ii) Use of weather data with the help of symbols. b) Estimation of Potential Evapo-transpiration by Thornwaite's Method and Construction of graphs showing Surplus, Deficit Water Budget and their Analysis.	12
5	Indian Daily Weather Report (IDWR): a) Study of Indian Daily Weather Report b) Analysis of Indian Daily Weather Report i) Temperature, ii) Air Pressure, iii) Humidity, iv) wind, v) Rainfall, etc. for various stations. Charting of Systems (5 years) c) Weather forecasting	12
Total Periods		60

Reference Books:

1. WMO No. 8 (1983): Guide to meteorological instruments and methods of observations
2. Thornthwaite, C. W. & Mather, J. R. (1957): Instructions and Tables for computing potential evapo - transpiration and water balance, Drexel Institute of Technology, Laboratory of Climatology.
3. Indian Daily Weather Report, IMD, Pune.
4. Oliver, John E. (1973) : Climate and Man's Environment, John Wiley and Sons, New York.

5. Critchfield, H.J., General Climatology, Prentice Hall, N.J., 1975.
6. Frederick K. and Edward J. Tarbuck, The Atmosphere: An Introduction to Meteorology, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
7. Strahler, A.N., Modern Physical Geography, John Wiley and Sons, New York, Singapore, 1987.
8. Trewartha, G.T., An Introduction to Climate, McGraw Hill, New York, 1980, Fifth Edition (International Student Edition).
9. Thompson Russell D., Applied Climatology - Principles & Practice, John Willey, New York, 1997.
10. Barry & Perry., Synoptic Climatology.
11. Blair, T.A., Climatology-General and Regional.
12. Chorley, R.J. & Barry, R.G., Atmospheric Weather and climate.
13. Donn, W.L., Meteorology.
14. Jackson, I.J., Climate, Water and Agriculture in the Tropics, 1977.
15. Kendrew, W.G., Climates of the Continents.
16. Lal, D.S., Climatology.
17. Mather, J.R., Climatology: Fundamental and Applications, 1974.
18. Patterson., Introduction to Meteorology.

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SEMESTER III

W. E. F. JUNE 2014-15

Semester III

Gg. 301: Geography of Resources.

Gg. 302: Fundamental of Remote Sensing.

Gg. 303: Fundamental of Geographical Information System & GPS.

Gg. 304: Practical's in Remote Sensing and Image Processing.

Gg. 305: Practical's in GIS & GPS Techniques with Help of Computer.

Gg. 306: Seminar - I

SEMESTER IV

W. E. F. JUNE 2018-19

Semester IV

Gg. 401: Watershed Management and Planning.

Gg. 402: Agricultural Geography.

Gg. 403: Regional Geography of India and Maharashtra.

Gg. 404: Instrumentation and Surveying.

Gg. 405: Project Work and Dissertation.

Gg. 406: Seminar - II

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Gg. 301: Geography of Resources.

Unit No.	Title	Periods
1	<p>A) Introduction to Resource Geography - a) Meaning and Definition of Resource. b) Importance of study of resources. c) Components of resources, natural and human.</p> <p>B) Classification of Resources - a) Basis of Classification: renewable and non-renewable resources. b) Importance of biotic and abiotic renewable resources. c) Importance of biotic and abiotic non-renewable resources.</p>	12
2	<p>A) Forest Resources - a) Use of forest resources. b) Environmental significance of forests. c) Distribution of Forest resources in Maharashtra and India. d) Meaning causes, significance and utilization of forest and effects of deforestation. e) Remedial measures to conserve forest resources. f) Methods of conservation of Forest resources.</p> <p>B) Water Resources - a) Water as a resource. b) Sources of water, significance and utilization of water resources. c) Distribution of water resources in Maharashtra and India. d) Uses of water resources – i) domestic, ii) agriculture, iii) industry, iv) transportation, v) tourism etc. e) Methods of conservation of water resources.</p> <p>C) Land Resources - a) Significance and utilization of land resources. b) Distribution of land resources in Maharashtra and India. c) Use of land resources: agriculture, forest, mining, settlements & other. d) Land degradation due to agriculture, mining and deforestation. e) Methods of conservation of land resources.</p>	12
3	<p>A) Mineral Resources - a) World distribution and production of iron ore, bauxite in major Countries. b) Distribution and production of iron ore, bauxite in India. c) Distribution and production of iron ore, bauxite in Maharashtra.</p> <p>B) Energy Resources - a) Distribution and production of coal, petroleum and natural gas in World, India & Maharashtra. b) Significance and utilization of solar, wind and nuclear energy resources in World, India and Maharashtra.</p> <p>C) Human Resources - a) Population as resource.</p>	12

	b) World distribution of population. c) Population distribution in India. d) Population distribution in Maharashtra. e) Concepts of over, optimum and under population.	
4	Resources and Economic development – with reference to Maharashtra and India. a) Role of land resources in economic development. b) Role of water resources in economic development. c) Role of mineral resources in economic development. d) Role of energy resources in economic development. e) Role of human resources in economic development.	12
5	Planning and Management of Resources. a) Concept of resource planning. b) Need of resource planning. c) Resource planning with reference to Maharashtra and India.	12
Total Periods		60

Reference Books

1. **Chempremae J. D.** (1989) : Geography and Energy, Longman Scientific and Technical Series. U. K.
2. **Daji J. A., Kadam J. R. and Patil, N. D.** (1996) : A Textbook of Soil Science, Media Promoters & Publishers Pvt. Ltd. Bombay.
3. **Gurjar & Jat** (2008): Geography of Water Resources, Rawat Publications, Jaipur.
4. **Negi B. S.** (1997) : Geography of Resources, Kedarnath Ramnath, Meerut.
5. **Owen S. and Owens P.L.** (1991) : Environment Resources and Conservation, Cambridge University Press, New York.
6. **Ray S.** (2008) : Natural Resources, Organization & Technology Linkages, Rawat Publication, Jaipur.
7. **Saxena H. M.** (2006) : Environmental Geography, Rawat Publications, Jaipur.
8. **Singh S.** (2004) : Environmental Geography, Prayag Pustak Bhawan, Allahabad.
9. **Skinner B. J.** (1969) : Earth Resources, Prentice-Hall, Englewood Cliffs, N. J.
10. **World Resources Institute (WRI)** 1994: World Resources 1994-95, Oxford University Press, New York.
11. **Zimmerman E. W.** (1951) : World Resources & Industries.

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Gg. 302: Fundamental of Remote Sensing.

Unit No.	Title	Periods
1	Introduction: History and Concepts, Advantages of Remote Sensing over conventional aerial photography - Data acquisition and data analysis - Energy sources and radiation principles, Energy interactions in the atmosphere, energy interactions with the earth surface features, Spectral reflectance of vegetation, soil and water.	12
2	Electromagnetic Spectrum : Electromagnetic Spectrum and characteristics of Wavelength Regions, Energy reflectance Principles and Spectral Signature characteristics, Atmospheric Windows an Absorption Bands, Sensor Characteristics, Spatial, Spectral, Radiometric and Temporal Resolutions. Basic concepts: Visible, Infrared, Thermal and Microwave remote sensing.	12
3	Microwave Remote Sensing: Introduction, Radar development, Side Looking Radars, Geometric characteristics of SLAR imagery - Earth surface feature characteristics influencing radar returns, image signatures and polarization.	12
4	Earth Resource Satellites: Introduction, early history of space imaging, platforms (ground, aerial and space) and sensors - Indian Remote Sensing Programs: Aryabhata, Bhaskara I and II programs, IRS satellite missions and their capabilities - Overview and scope of the future IRS Missions.	12
5	Techniques of interpretation: Aerial photo interpretation, satellite image interpretation, Recognition elements: Tone, Colour, Texture, Pattern, Shape, Size and associated features	12
Total Periods		60

Reference Books

1. **Virginia (1966) :** Manual of Photogrammetry (3rd ed.) American Society of Photogrammetry.
2. **Virginia (1975) :** Manual of Remote Sensing, American Society of Photogrammetry.
3. **Avery, T. E. and G. L. Berlin (1983, 1992):** Fundamentals of Remote Sensing and Airphoto Interpretation, 5th ed., MacMillan Publishing Co. New York.
4. **Curran, P. J. (1988) :** Principles of Remote Sensing, Longman, ELBS edition, Hong Kong.
5. **Kellaway, George P. (1956) :** Map Projection, Methuen & Co., London.
6. **Lillesand, T. M., and Kieffer, R. W. (1979) :** Remote Sensing and Image Interpretation, John Wiley and Sons, New York.
7. **Sabins, F. F. (Jr.) (1987) :** Remote Sensing Principles and Interpretation, 2nd ed., W.H. Freeman and Co., New York.
8. **Steers, J. A. (1957) :** Map Projections, University of London Press, London.
9. **Manual of Remote Sensing (1980) :** Vol I and II, American Society of Photogrammetry. 4th

Ed., Falls Church,.

10. **Avery, T.E. and G.L. Berlin (1985)** : Interpretation of Aerial Photographs, 4th Ed., Bergess Minneapolis, Minn.
11. **Bruno Marcolongo and Franco Mantovani (1997)** : Photogeology and Remote Sensing Applications in Earth Science, Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
12. **Pandey S.N. (1987)** : Principles and Applications of Photogeology by, Wiley Eastern.
13. **W.G. Rees (1990)** : Physical Principles of Remote Sensing , Cambridge University Press.
14. **Sabins, F.F. (1986)** : Remote Sensing Principles and Interpretations by, 2nd Ed. W.H. Freeman and Company, New York.
15. **Verbyia D. (1995)** : Satellite Remote Sensing for natural resources, Lewis Publishers, Boca Rotaon, F.L.
16. **Wolf P.R. (1983)** : Elements of Photogrammetry, McGraw-Hill, New York.

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Gg. 303: Fundamental of Geographical Information System & GPS.

Unit No.	Title	Periods
1	Fundamentals of GIS : Concepts and definitions; Evolution and development of GIS; Computer environment for GIS; Elements of spatial data and their graphical representation- Thematic maps; Scales and symbolization; Map projections; spatial data models and data structure in GIS environment - modeling surfaces, networks, terrain, relief and time – virtual maps.	12
2	GIS Technology : Co-ordinate system-basic principles of cartography and computer assisted cartography for GIS; Remote Sensing data as a data source for GIS; Integration of GIS, Remote Sensing & GPS technology; Creation of location and attribute data bases-Vector and raster formats digitizing and scanning- data editing and validation - geocoding.	12
3	Data analysis and manipulation : Measurement in GIS- classification, overlay analysis and intergradations of data-buffering- shortest path-interpolation-analysis of surfaces and networks; Modeling - physical and environmental processes and human activities; visualization and mapping-forms of output: map, tables, report - Cartographic principles and techniques of graphic representation - inbuilt tools and facilities in a GIS package.	12
4	Application of GIS technology : GIS as decision support system; Application of GIS technology in utilities management and other fields - GIS in land information system, urban management, environmental of management and emergency response system; Adoption of GIS technology in India; GIS project designing and implementation, Future prospects of GIS.	12
5	Introduction of GPS : Overview of GPS technology, GPS receivers', Basic geodesy, Surveying, Satellite constellation, Satellite signals & data, Single point positioning, Measuring distance & timing, GPS accuracy, Error corrections, Differential GPS, GLONASS & GALILEO systems, Application of GPS, Carrying out GPS survey.	12
Total Periods		60

Reference Books:

1. **Chang, Kang - Tsung (2008) :** Introduction to Geographic Information Systems, 4th ed., Tata McGraw- Hill Publishing Company Limited, New Delhi.
2. **DeMeers, Michael N.(2005) :** Fundamentals of Geographic Information Systems, 3rd. ed., John Wiley & Sons, Toronto.

3. **Fazal, S. (2008)** : GIS Basics, New Age International Publishers, New Delhi.
4. **Fazal, S. and Rahman, A. (2007)** : Geographic Information System (GIS) Terminology, New Age International Publishers, New Delhi.
5. **Heywood, Ian Cornelius, Sarah and Steve Carver (2006)** : An Introduction to Geographical Information Systems, 2nd ed., Pearson Education Limited, Toronto.
6. **Siddiqui, M.A. (2006)** : Introduction to Geographical Information Systems, Sharda Pustak Bhavan, Allahabad.
7. **Aronoff, S. (1992)** : Geographic Information Systems : A Management Perspective, WDL Publications Ottawa, Canada.
8. **Burrough, Peter A. and Rachael A. McDonnell. (1998)** : Principles of Geographical Information Systems, Oxford University Press, Toronto.
9. **ESRI (1990)** : Understanding GIS, Environmental Systems Research Institute, U.S.A., 1993.
10. **Jefrey, S. & John, E.** : Geographic Information Systems – An Introduction, Prentice Hall, New Jersey, USA.
11. **Lo, C.P and Albert K.W., Yeung (2007)** : Concepts and Techniques of Geographic Information Systems, 2nd ed., Pearson Education Inc., Toronto, Canada.
12. **Longley, Paul A., Goodchild, Michael F.Maguire, David J., & David W. Rhind. (2005):** Geographic Information Systems and Science, 2nd ed., John Wiley and Sons, England.
13. **S. Aronoff (1989)** : Geographic Information Systems: A Management Perspective, D. D. L. Publication, Ottawa.
14. **P. A. Burrough (1986)** : Principles of Geographic Information Systems for Land Resource Assessment, Oxford University Press, New York.
15. **D. R. Fraser, Taylor (1991)** : Geographic Information Systems, Pergaman Press, Oxford.
16. **Marks S. Monmonier (1982)** : Computer- Assisted Cartography, Prentice Hall, Englewood Cliff, New Jersey.
17. **I. Heywood et al (2002)** : An Introduction to Geographical Systems, Pearson Education Ltd, New Delhi.
18. **David Martin (1996)** : Geographical Information Systems: Socio-Economic Application, IInd Edition, Routledge, London & New York.
19. **William E. Huxhold** : An Introduction to Urban Geographic Information Systems, Oxford University Press, New York.
20. **John Pickles (1995)** : Ground Truth: The Social Implications of Geographical Information Systems, the Guilford Press, New York, 1995.

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Gg. 304: Practical's in Remote Sensing and Image Processing.

Unit No.	Title	Periods
1	Photogrammetry – Stereoscopic Vision Test Format and stereoscopic Orientation of Aerial Photographs Determination of scale and Stereoscopic area Determination of Principal Point and Conjugate Principal Point Direction of Flight line and Air Base. Calculation of traffic Speed through Aerial Photographs Calculation of Photographic coverage for a Planning Area	12
2	Photogrammetry – Height Determination Methods Mapping Land Use change Detection Land use Measurement Methods Preparation of Land cover and Land use Map Interpretation of Aerial Photographs Population Census with Aerial Photographs	12
3	Image Processing - - Image interpretation, basic principle, factors governing quality of images, elements of image interpretation and techniques of image interpretation. - Use of multiple images in image interpretation, seasonal differences on images, comparisons of seasonal images, winter and summer images. - Thermal infrared images; thermal processes and properties, heat, temperature and radiant flux, IR region of the electromagnetic spectrum, IR detection and imaging technology, characteristics of IR images, advantages of thermal imagery.	12
4	Image Processing - - Introduction of image processing, forms of mages, different image processing techniques, computer image processing, digital image processing, image restoration image enhancement, edge enhancement, ratio images.	12
5	Field Work and Survey: A) Prepare questionnaires as per the Govt. survey methods. B) A group of five students should select one geographical site. C) Students should collect Census Data through instrument and modern techniques. Prepare report and present survey report with help of power point presentation (PPT) in front of examiner at the examination time. Report Writing Method - a) Research Methodology b) Data Analysis Techniques: Students Should analyze data by using techniques given in the syllabus. d) Data Presentation Techniques	12

e) Concluding remarks	
f) References & Bibliography	
Total Periods	60

Reference Books

1. **Virginia (1966)** : Manual of Photogrammetry (3rd ed.) American Society of Photogrammetry.
2. **Virginia (1975)** : Manual of Remote Sensing, American Society of Photogrammetry.
3. **Avery, T. E. and G. L. Berlin** : Fundamentals of Remote Sensing and Airphoto Interpretation, 5th ed., New York, MacMillan Publishing Co., 1983, 1992.
4. **Curran, P. J.** : Principles of Remote Sensing, Longman, ELBS edition, Hong Kong, 1988.
5. **Kellaway, George P.** : Map Projection, Methuen & Co., London, 1956.
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7. **Sabins, F. F. (Jr.)** : Remote Sensing Principles and Interpretation, 2nd ed., W.H. Freeman and Co., New York, 1987.
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Gg. 305: Practical's in GIS & GPS Techniques with Help of Computer.

Unit No.	Title	Periods
1	<p>Introduction to GIS a) Introduction to GIS software ILWIS and Arc GIS and GPS etc. b) Applications of ILWIS software - Introduction to Menu, main windows, tools, navigation bar, catalogue, operation tree, command box, domain and attribute tables. c) Introduction of GPS, data collection and mapping by using GPS Software.</p>	12
2	<p>Applications of ILWIS software - Geo-referencing a) Import scanned/digital image b) Coordinate system c) Geo-referencing Creation of layers a) Concepts: point, segment and polygon layers b) Point layers: Settlements and Wells c) Segments layers: Contours, boundaries, rivers and roads d) Polygon layers: village, farm and forest Attribute data Tabulation and attachments</p>	12
3	<p>Applications of ArcGIS software - Introduction to Menu, main windows, tools, navigation bar, catalogue, operation tree, command box, domain and attribute tables.</p>	12
4	<p>Applications of ArcGIS software - Geo-referencing - a) Import scanned/digital image b) Coordinate system c) Geo-referencing Creation of layers a) Concepts: point, segment and polygon layers b) Point layers: Settlements and Wells c) Segments layers: Contours, boundaries, rivers and roads d) Polygon layers: village, farm and forest Attribute data Tabulation and attachments</p>	12
5	<p>Applications of GIS Software - a) Mapping b) Interpolation c) Classification Applications of GIS Software in Geographical fields – a) Applications of GIS Software for land management –</p>	12

b) Applications of GIS Software for resource management – c) Applications of GIS Software for water management - d) Applications of GIS Software for rural & urban planning management -	
Total Periods	60

Reference Books:

1. **Lillesand, Thomas M. & Kiefer Ralph (2000)** : Remote Sensing and Image interpretation, Jonh Wiley.
2. **Agarwal C.S.and Garg P.K. (2002)** : Text Book on Remote Sensing, Wheeler Publishing New Delhi.
3. **Prithvish Nag and M. Kudrat (1998)** : Digital remote Sensing , Concept Publishing Company, New Delhi.
4. **William Jonathan (1995)** : Geographic information from Space : Processing and applications of Geocoded Satellite Images, John Wiley & Sons.
5. **Taylor and Francis (1996)** : Spatial analytical on GIS DeBarry ,Paul A. (1999) GIS Modules and Distributed Models of the Watershed: A Report from ASCE Task Committee on GIS Modules and Distribution, ASCE.
6. **Burrough, P.A. (1986)** : Principles of Geographical information System for Land Resources Assessment, Oxford University Press.
7. **Environment System Research Institute (1993)** : Understanding GIS , The Arc Info Method.
8. **Bernhardsen, Tor (1999)** : Geographic Information System, An Introduction, John Wiley & Sons.
9. **Clarke ,Keith C. (1999)** : Getting Started with Geographic Information System , Prentice Hall.
10. **Demers, Michael N. (2000)** : Fundamentals of Geographic Information System ,John Wiley.
11. **Haywood, Ian (2000)** : Geographical Information System, Longman.
12. **Chang, Kang-taung (2000)** : Introduction to Geographic information System, Tata McGraw Hill.

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**SEMESTER IV
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Semester IV

- Gg. 401: Watershed Management and Planning.
- Gg. 402: Agricultural Geography.
- Gg. 403: Regional Geography of India and Maharashtra.
- Gg. 404: Instrumentation and Surveying.
- Gg. 405: Project Work and Dissertation.
- Gg. 406: Seminar - II.

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Gg. 401: Watershed Management and Planning.

Unit No.	Title	Periods
1	<p>Introduction To Watershed –</p> <p>a) Concept of watershed, characteristic of watershed and classification of watershed.</p> <p>b) Significance of watershed development.</p> <p>c) Demarcation of watershed</p> <p>d) Types of watershed according to area and shape.</p>	12
2	<p>Physical parameters of watershed –</p> <p>A) Channel geometry & basin morphology:</p> <p>a) Hydraulic geometry at channel cross section & along the channel.</p> <p>b) Channel cross section pattern.</p> <p>c) Channel types.</p> <p>B) Basin morphology:</p> <p>a) Drainage network & watershed boundary.</p> <p>b) Drainage frequency, drainage density & constant of channel maintenance.</p> <p>c) Basin morphology.</p> <p>i) Horton’s form factor.</p> <p>ii) Millar’s circularity ratio.</p> <p>iii) Schumm’s elongation ratio.</p> <p>iv) Strahler’s ruggedness index.</p> <p>v) Strahler’s hypsometric integral.</p> <p>C) Landuse:</p> <p>a) Measurement & data sources.</p> <p>b) Land Use and Land Cover:</p> <p>i) Total geographical area.</p> <p>ii) Classification of Land Net Sown, Residential, Fallow, Forest, Waste/Desert.</p> <p>D) Terrain analysis:</p> <p>Terrain analysis on the basis of -</p> <p>i) Relief characteristics.</p> <p>ii) Slope.</p> <p>iii) Dissection index.</p> <p>iv) Drainage characteristics: Spatial distribution of drainage frequency and drainage density.</p> <p>v) Soil</p>	12
3	<p>Hydrological parameters –</p>	12

	A) Rainfall: a) Intensity & duration, b) Measurements. B) Aerial precipitation: a) Thiessen polygons, b) Isohytal method. C) Evaporation & transpiration: a) Methods, b) Instruments. D) Infiltration: a) Methods, b) Instruments E) Run off: a) Measurement, b) Selection, criteria of gouging station. F) Discharge: a) Measurements, b) Unit hydrograph.	
4	Ground and Underground Water - A) Ground Water: i) Definition ii) Aquifer types iii) Water table iv) Porosity v) Ground water movement vi) Recharge & discharge B) Water management: a) Rainwater harvesting. b) Percolation tanks & pits. c) Sprinkle irrigation. C) Development programmes: a) Artificial recharge of ground water. b) Dams & weirs. c) Interlinking of rivers.	12
5	Sample of Watershed Management and Planning – A) Types of Survey for watershed development i) Physical survey ii) Hydrological iii) Land use iv) Survey of Resources B) Advance Techniques for watershed development i) Remote sensing data analysis ii) Application of RS and GIS in watershed management	12
Total Periods		60

Reference Books

1. **Murthy J.V.S.** (1994) : Watershed Management in India, Wiley Eastern Ltd. New Delhi.
2. **Paranjape S. and Other** (1980) : Water based Development, Bharat Gyan Vigyan Samithi, New Delhi.
3. **Mutreja K.N.** (1990) : Applied Hydrology, Tata Mc Graw Hill Pub. Co. Ltd. New Delhi.
4. **Shing R.J.** (2000) : Watershed planning and Management, Yash Publishing House, Bikaner.
5. **Chanda B. , Dattaa D., Mujumdar** (2001) : Digital Image Processing and Analysis, Prentice-Hall of India.
6. **Prithvish Nag and M. Kudrat** (1998) : Digital Remote Sensing , Concept Publishing Co. New Delhi-
7. **Basudeb Bhatta:** Remote Sensing and GIS, 2nd ed., Oxford university press, Printed by- Radha press, New Delhi.
8. **M. Anji Reddy:** Text book of Remote Sensing and GIS, 3rd Ed., BS Publications, Hydrabad.

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Gg. 402: Agricultural Geography.

Unit No.	Title	Periods
1	<p>Introduction to Agricultural Geography – Definition, Nature, Scope and Approaches, Origin and dispersal of agriculture, significance and development of agricultural geography. Approaches to the study of agricultural geography - Environmental, Regional, Commodity and Behavioral approach Significance of Agriculture - Place of agriculture in Different Economies – Significance of agriculture in world regions, Importance of agriculture in the Indian Economy.</p>	12
2	<p>A) Fundamental concepts in agricultural geography – Meaning and explanation. 1) Crops : i) Cropping pattern, ii) Crop rotation, iii) Intensity of cropping, iv) Crop concentration, v) Crop diversification, vi) Crop combination. 2) Agricultural Production and Development : i) Agricultural efficiency, ii) Agricultural productivity, iii) Agricultural labor productivity, iv) Marginal land, v) Agricultural development, vi) Sustainable Agricultural development.</p> <p>B) Determinants of Agricultural Patterns – Influence of Physical, Economic and Technological Factors. 1. Altitude, Relief, Climate, Soil - 2. Size of Land holding, 3. Land Tenancy, 4. Marketing facilities - 5. Transport - 6. Irrigation - 7. Mechanization and Equipments - 8. Biochemical inputs – 9. Government policies – 10. Capital and Labor – 11. Religion -</p>	12
3	<p>A) Agricultural Types and Characteristics – Study of the following types of agriculture in respect of areas, salient features and their problems - 1. Shifting cultivation 2. Intensive subsistent farming. 3. Mixed farming 4. Plantation agriculture 5. Commercial grain farming 6. Dairy farming</p>	12

4	<p>A) Agricultural Land Use Concepts – 1. General Land use, 2. Agricultural Land use, 3. Arable land, 4. Net sown area, 5. Gross cropped area, 6. Land reform and 7. Land tenure -</p> <p>B) Agricultural Statistics & Land use Survey techniques - Sources of agricultural statistics - i) Primary Sources of Agricultural data observation, interview, questionnaire & schedule) ii) Secondary Sources of agricultural data (Indian Agricultural Statistics, Agricultural seasons and crop reports, crop statistics, irrigation statistics, agricultural prices, World Agricultural Statistics & other statistics)</p> <p>C) Land Classification in India and Maharashtra –</p>	12
5	<p>A) Agricultural regionalization Methods of Regionalization - 1. Views of Baker Whittles Hann. 2. Crop combination techniques - Weaver and Thomas method. 3. Agricultural efficiency - Kendall’s ranking coefficient, Bhatia’s method. 4. Agricultural location models: Von Thunen and Losch Models & its modifications. 5. Agricultural regions of India.</p> <p>B) Problems & Prospects of Agriculture in India - Semi-arid & arid regions in India 1. Definition and characteristics of arid and semi-arid regions. 2. Droughts and famines 3. Role of irrigation and dry farming.</p> <p>C) Contemporary Issues In Indian Agriculture - 1. Nutrition, Malnutrition and Hunger; 2. Rural poverty and unemployment; 3. Food aid and nutrition programmes; 4. Food security and its components.</p>	12
Total Periods		60

Reference Books

1. **Singh. J. & Dhillon S.S.** (1994) – Agricultural Geography, Tata McGraw Hill, Publishing Co. Ltd.
2. **Grigg. D.G.** (1964) – An Introduction to Agricultural Geography Hutchinson & Co.Ltd.,
3. **Morgan. W.B. & S.C. Monton** (1971) – Agricultural Geography Methuen, London.
4. **Symons Leslie** (1970) – Agricultural Geography, G. Belt and Sons Ltd., London.
5. **Tarrent, J. R.** (1970) – Agricultural Geography, David and Charles, Newton Abbot.
6. **Grigg. D. G.** (1974) – The Agricultural Systems of the world An Evolutionary Approach.
7. **Illbery, B.W.** (1985) – Agricultural Geography, Social & Economic Analysis, Oxford University Press.
8. **Husain M.** (1979) : Agricultural Geography; Inter India Publishers; New Delhi.
9. **Randhawa M. S.** (1980) – An History of Agriculture in India Vols. I, II, III,IV ICAR, New Delhi.
10. **Majid Husain** (2010) – Systematic Agricultural Geography, Rawat Publications, Jaipur.
11. **Grigg, D. B.** (1974.) : The Agricultural Systems of the World. Cambridge University Press, New York.
12. **Morgan, W.B.** (1978) : Agriculture in the Third World - A Spatial Analysis. West view Press, Boulder.

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Gg. 403: Regional Geography of India and Maharashtra.

Unit No.	Title	Periods
1	India in the context of Southeast and South Asia; India: (With reference to Maharashtra) Land of diversities; unity within diversities, Major terrain elements of India and their role in shaping physical landscape of India. Drainage systems of India and their functional significance. The morphological regions of India.	12
2	Regional and Seasonal variations of Climate : (With reference to Maharashtra) The monsoon, western disturbance, norwesters, Climatic regions of India. Soil types of India-their distribution and characteristics; Vegetation types and their distribution, Forests, Minerals and Power resources - The status of their use and need for conservation.	12
3	Spatial distribution : (With reference to Maharashtra) Spatial distribution of population and density; socio-economic implications of population explosion; urbanization, changing nature of Indian economy. Agricultural growth during the plan period; Green Revolution vis-à-vis traditional farming; regionalization of Indian agriculture, and typology of agricultural regions and their relevance in agricultural development planning. Industrial development and Indian economy; industrial regions of India and their industrial structure, composition of domestic and international trade.	12
4	Basis of regional divisions of India : (With reference to Maharashtra) Macro, meso and micro - regions of India – their comparative analysis. Resource Regions of India, regional planning of rural and urban regions.	12
5	Contemporary issues: (With reference to Maharashtra) Regional disparity; poverty, globalization, Impact of development on Environment, social and ethnic tension; gender discrimination and empowerment of women.	12
Total Periods		60

Reference Books:

1. **Deshpande C.D.** (1992) : India-A Regional Interpretation Northern Book Centre, New Delhi.
2. **Farmer, B.H.** (1983) : An Introduction to South Asia. Methuen, London.
3. **Govt. of India** (2001): India - Reference Annual, 2001 Pub. Div, New Delhi.
4. **Govt. of India:** National Atlas of India, NATMO Publication, Calcutta.

5. **Govt. of India** (1965): The Gazetteer of India. Vol I & III Publication Division, New Delhi.
6. **Learmonth, A.T.A.** : Man and Land of South Asia Concept, New Delhi.
7. **Mitra, A.** (1967) : Levels of Regional Development India Census of India, Vol - I, Part I- (i) and (ii) New Delhi.
8. **Routray, J.K.** (1993) : Geography of Regional Disparity Asian Institute of Technology, Bangkok.
9. **Shafi, M.** (2000): Geography of South Asia, McMillan & Co., Calcutta.
10. **Singh, R.L.** (1971) : India: A Regional Geography, National Geographical Society, Varanasi, India.
11. **Spate, O.H.K. and Learmonth, A.T.A.** (1967) : India and Pakistan - Land, People and Economy Methuen & Co., London.
12. **Valdiya, K.S.** (1998) : Dynamic Himalaya, University Press, Hyderabad.
13. **Wadia, D.N.** (1967) : Geology of India, McMillan & Co., London.

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Gg. 404: Instrumentation and Surveying.

Unit No.	Title	Periods
1	<p>Surveying: Meaning and definition, Types of surveying, Characteristics, Importance and application in various sectors.</p> <p>A) Plane Table Survey -</p> <p>i) Equipments required for plane table survey</p> <p>ii) Plane table survey-Radiation Method and Intersection Method.</p> <p>B) Prismatic Compass Survey -</p> <p>i) Systems of expressing bearing-</p> <p>1) Whole circle System 2) Quadrant system.</p> <p>ii) Prismatic compass traverse methods-</p> <p>1) Open Traverse 2) Closed Traverse.</p> <p>iii) Correction of bearing and closing of error by Bowditch method.</p> <p>C) Chain-Tape Survey -</p> <p>i) Equipments required for chain - tape survey</p> <p>ii) Methods for chain – tape Survey</p> <p>D) Geodetic Surveying -</p> <p>Definition and methods, triangulation, benchmarks, spot heights and reduced levels, interpolation, contouring.</p>	12
2	<p>Theodolite –</p> <p>The Instrument, types, advantages and disadvantages and application of Theodolite.</p> <p>1. Various components and least count of the instrument.</p> <p>2. Methods of surveying and preparation of at least two contour maps by intersection and tachometry</p>	12
3	<p>Dumpy level –</p> <p>The instrument, types, advantages and disadvantages and application of Dumpy Level.</p> <p>1. Various components: Methods of surveying and leveling.</p> <p>2. Field surveying and leveling by Colimation and rise and fall method and block contouring.</p>	12
4	<p>Advance Surveying techniques - Total Station –</p> <p>The instrument, types, advantages and disadvantages and application of Total Station.</p> <p>1. Various components, methods of surveying.</p> <p>2. Leveling, Centering and Station setup-</p> <p>3. Data Collection –</p> <p>4. Stakeout and Demarcation –</p> <p>5. Post processing by using any supported GIS software.</p>	12
5	<p>Advance Surveying techniques -</p>	12

	<p>A) Global Positioning System (GPS) – Introduction GPS, Components of GPS, Application of GPS and Data collection, Prepare map using Surfer Software.</p> <p>B) Differential Global Positioning System (DGPS) – The instrument, types, advantages and disadvantages and application of DGPS.</p> <p>C) Remote Sensing Survey – Aerial photography and satellite imageries -</p>	
Total Periods		60

Reference Books

- 1) **Gopal Singh:** Map Work and Practical Geography, Vikas publishing house, New Delhi.
- 2) **Kanatkar T. P. and Kulkarni S.V. :** Surveying and Leveling, Pune vidyarthi griha prakashan, pune.
- 3) **Davis, R.E. and Foote, F.S. (1953) :** Surveying, McGraw-Hill Book Co. New York.
- 4) **Deshpande, G.B.(1991) :** Surveying, Everest publishing house, pune.
- 5) **Khan M.Z. (1998):** Text book of Practical Geography, concept publishing company, New Delhi.
- 7) **Sing R.L. & Singh R.P. (1993) :** Elements of Practical Geography, Kalyani Publisher, New Delhi.

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SYLLABUS
Semester IV
(w. e. f. - June 2018-19)

Gg. 405: Project Work and Dissertation.

Unit No.	Title	Periods
1	<p>Research Techniques and Methodology -</p> <p>a) Introduction to Project Report b) Selection of Topic, sources of data collection and types of data c) Data feeding techniques d) Research techniques and methodology e) Data Analysis techniques f) Cartographic techniques g) Guidance for report writing, checking and to prepare the students for examination h) Total five Seminars (two hours per seminar) of students on selected topic and guidance to develop the communication skill of the students</p>	12
2	<p>Students should prepare individual project report on any one topic from the list of the following subjects with the help of concern guide:</p> <p>a) Physical Geography – i) Geomorphology, ii) Climatology, iii) Oceanography, iv) Soil Geography, v) Environmental Geography, vi) Plant Geography, vii) Animal Geography, viii) Bio-Geography or any other related to Physical Geography. B) Human Geography – i) <u>Economic Geography –</u> a) Agriculture Geography, b) Resources Geography, c) Industrial Geography, d) Trade and Transport Geography, e) Travel and Tourism Geography, f) Commercial Geography, g) Marketing Geography, h) Regional Geography. ii) <u>Social Geography –</u> a) Population Geography, b) Settlement Geography, c) Social Geography, d) Cultural Geography, e) Rural Geography, f) Urban Geography, g) Geography of Health, h) Criminal Geography, i) Behavioral Geography. C) Analytical Techniques in Geography - i) Cartography, ii) GIS and Computer mapping, iii) Remote Sensing Techniques, iv) Quantitative Techniques.</p>	12
3	<p>While preparing the project students should follow the guidelines cited as below :</p> <p>a) Research methodology should be adopted. b) Data should be analyzed through M.S. Excel worksheet or Access, Minitab, SPSS for data calculation. c) All maps should be prepared by using GIS Software. d) At list 10 maps and necessary diagrams, flowcharts should be prepared</p>	12
4	<p>Submission of Project Report:</p> <p>a) Student will prepare three printed copies of their project report.</p>	12

	<p>b) Submit two printed copies of project along with two CDs of project report in PDF format and PPT of presentation to department Eight days before the practical examination. Submit hard copy of raw data used for project report.</p>	
5	<p>Examination System: a) At the time of examination student will present the project with the help of PowerPoint. b) Student will interface the questions asked by examiners and participants c) All students are allowed to attend the open defense viva at the time of examination.</p> <p>Note: Manual data analysis & mapping will not be entertained.</p> <p>Marking System: A) Internal Assessment and performance of student ----- 40 marks B) External examination----- 60 marks a) Project Report----- 40 marks b) Project Presentation----- 20 marks</p> <p>a) Project Report: i) Research methodology and techniques adopted----- 10 marks ii) Maps and Diagrams ----- 20 marks iii) Preparation and set-up of Project report----- 10 marks b) Project Presentation: i) General performance of Student ----- 04 marks ii) Map Interpretation ----- 04 marks iii) Data presentation techniques----- 04 marks iv) Preparation of slides and animation techniques----- 04 marks iv) Oral and presentation skill ----- 04 marks</p>	12
Total Periods		60

SCHOOL OF ENVIRONMENTAL AND EARTH SCIENCES

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Model for implementation of the Credit-Grade based Performance and Assessment (CGPA) system

M. A. / M. Sc. Course

In tune with the concept and suggestions of the UGC and NAAC, technological advancement and social needs and to make the teaching effective and meaningful, School of Environmental and Earth Sciences has been permitted to adopt Credit-Grade based Performance and Assessment (CGPA) system from the academic year 2009-2010 for the course M. A. & M.Sc. (Applied Geography) being run in the school. The modalities and operational details of the credit system shall be as follows.

A. Features of the CGPA System:

1. Master's degree course, M. A. & M. Sc. being run in School would be of 84 credits each.
2. One credit for the theory course shall be of the one clock hour per week running for 15 weeks. Thus, each theory course of 4 h per week teaching shall be of 4 credits.
3. Four credits for each practical course shall be awarded to the 8 h of laboratory exercise per week for a semester. As per the guidelines of the work load, each batch for practical course shall consist of 8-12 students and each batch shall perform the laboratory exercise twice in a week. Thus, each practical course shall be of 8 h laboratory exercise per week with 4 credits.
4. Four credits shall be awarded to the Project course, which will commence from III Semester and the final work and report will be completed during IV Semester. The marks and the credits will be allotted in IV Semester.
5. Two credits, one each in first two semesters (i.e. for Semester I and II) have been allocated for the Tutorials/Home assignments. Besides, for every theory course one Take Home Assignments of 40 marks each shall be conducted. Average marks of all the home assignment in the given semester will be considered. No grade will be given for the tutorial. However, the completion of the credit for the tutorial shall be compulsory.
6. Two credits, one each in the III and IV semesters have been allocated for the Seminar. There shall be one seminar per student. Marks out of 40 will be allocated per semester for this as per break up given below in (g). No grade will be given for the seminar. However, the completion of the credit for the seminar shall be compulsory.
7. Every student shall complete 84 credits in a minimum of four semesters. All Semesters will have 21 credits each.
8. Academic calendar showing dates of commencement and end of teaching, internal assessment tests and term end examination shall be duly notified before commencement of each semester every year by the School.

B. Evaluation of the student:

- (a) The evaluation of the student shall be divided into two parts viz. **Internal Assessment** and **Term End Examination (semester end examination)** with a weightage in the ratio of 40:60 as approved by the committee.
- (b) Standard of passing –
- (i) There shall not be pass or fail for the internal assessment. However, the attendance for the internal assessment shall be compulsory.
- (ii) Minimum marks for passing the Term End Examination in theory/practical/project course shall be 40%.
- (iii) Minimum marks for passing the theory/practical/project course (i.e. sum of the marks obtained in internal and term end examination) shall be 40%.
- (c) The distribution of marks for each theory paper of 4 credits at term (Semester) end examination and for continuous internal assessment (Minor tests), as approved by the committee shall be as follows:

Theory Examination	Maximum marks
Internal assessment	40
Term end examination	60
Total marks	100

- (d) The distribution of marks for each laboratory course of 4 credits at term (Semester) end examination and for continuous internal assessment (Minor tests), as approved by the committee shall be as follows:

Practical Examination	Maximum marks
Internal assessment	40
Term end examination	60
Total marks	100

- (e) The Project course will commence from III Semester and the final work and report will be completed during IV Semester. The marks and the credits will be allotted in IV Semester. The distribution of marks for Project course of 4 credits at term (Semester) end examination and for continuous internal assessment (Minor tests), as approved by the committee shall be as follows:

Practical Examination	Maximum marks
Internal assessment	40
Term end examination	60
Total marks	100

(f) Internal Assessment:

- (i) Internal assessment for each course would be continuous and dates for each internal test/practical test will be pre-notified in the time table for teaching or placed separately as a part of time table.
- (ii) Each subject teacher shall coordinate this activity and maintain the record of the internal tests conducted.
- (iii) Internal assessment for each course shall be of 40 marks.

	Heads	Marks	Evaluating Authority
(iv)	Marks for journal	10	Concerned practical in-charge
	Experimental work carried by student	20	
	Viva-voce	10	
	Total marks	40	

There shall not be pass or fail for the internal assessment. However, the attendance for the internal assessment shall be compulsory.

For Theory Courses:

- (i) Two internal tests for each theory course comprising of 4 credits shall be conducted by the subject teacher.
- (ii) Each test shall be of 40 marks.
- (iii) The marks for each test shall be displayed on notice board within seven days of conducting the test.
- (iv) It is mandatory to show the answer sheets of all tests to the students.

For Practical Courses:

The internal assessment for the practical courses will be based on the following 03 heads:

For Project course

- (i) The Project course will commence from III Semester and the final work and report will be completed during IV Semester.
- (ii) Every student has to undertake a project of interest. The project may be related to a theoretical analysis, an experimental investigation, a proto-type design, a new correlation and analysis of data, fabrication and setup new equipment. Ordinarily, the Project Co-ordinator shall be chosen by the student depending on his/her subject interest. The project co-ordinator assigns the topic for the project and the work is done uniformly during both the semesters of the final year.
- (iii) The marks and the credits will be allotted in IV Semester.
- (iv) On the basis of marks obtained in Seminar, the marks out of 40 will be given for the Seminar.

	Heads	Marks	Evaluating Authority
	Performance of the student in the collection of reference material for project work and punctuality	10	Concerned Project guide
	Experimental work carried out by the student	20	
	Viva-voce	10	
	Total marks	40	

For Tutorial:

- (i) Two credits based on Tutorial component, one each in I and II semesters will constitute the compulsory part.
- (ii) For every theory course one Take Home Assignments of 40 marks each shall be given.
- (iii) The evaluation will be based on following two heads:

Head	Marks	Evaluating Authority
Take Home Assignment	40	Concerned subject teacher

- (iv) On the basis of marks in Tutorials for theory courses, the average will be calculated and the marks out of 40 shall be awarded for the Tutorial.

For Seminar:

- (i) Two credits based on Seminar component, one each in the III and IV semesters will constitute the compulsory part.
- (ii) Each student shall deliver one seminar per semester and there will be a continuous evaluation of the seminar.
- (iii) The evaluation will be based on following four heads:

Heads	Marks	Evaluating Authority
collection of reference material for seminar	10	Concerned course teacher
Content of the seminar	20	
Performance in seminar/presentation	10	
Total marks	40	

- iv) On the basis of marks obtained in Seminar, the marks out of 40 will be given for the Seminar.

g) Term end examination:

- (i) The term end examination for 60 marks per course would be held about a week after completion of teaching for the semester.
- (ii) The term end examination of maximum marks 60 and its assessment work shall be conducted by the School from the academic year 2009-10 under the academic flexibility granted to the School by the University.

For Theory Courses:

- (i) The subjective pattern of the question paper will adopt from academic year 2017-2018.
- (ii) Each theory paper of 60 marks shall be of the three hours duration.

For Practical Courses:

- (i) The term end practical examination shall be of 60 marks and it is of duration 06 h.
- (ii) There shall be two examiners for the practical examination out of which one examiner shall be from the other University/Institute.

For Project course

- (i) The project report should be submitted by the prescribed date. Submission of the project cannot be postponed beyond the date specified in the calendar.
- (ii) Students should submit 2 bound typed copies of Project Report to the department. A student who is unable to complete his/her Project may be awarded 'X' grade and he/she will be required to register for the next Semester and pay the fees under following circumstances:
Exceptional circumstances beyond students / supervisor control
Medical grounds
- (iii) There shall be two examiners for the evaluation of Project, out of which one examiner shall be from the other University/Institute.
- (iv) The examiners shall evaluate the report and an oral examination shall be conducted. The assessment of the project work is done on the following basis-

Heads	Marks	Evaluating Authority
Performance of the student in the presentation of the project work and report	10	Panel of examiners
Experimental work carried out by the student	40	
Viva-voce	10	
Total marks	60	

C. Grades :

- (i) Marks for each course would be converted to grades as shown in Table 1.

Table 1: Conversion of marks to grades in credit system

Marks obtained	Grade	Grade Points
90-100	A+	10
80-89	A	9
70-79	B+	8
60-69	B	7
55-59	C+	6
45-54	C	5
40-44	D	4
39 and less	F	0

- (ii) The grade point will be given on the total marks (sum of mark obtained in internal assessment and term end examination) obtained in the said subject.
- (iii) A student who fails in a course (i.e. He scores less than 24 out of 60 marks in the Term End Examination or less than 40 out 100 marks) shall be given F grade. Student with F grade in course would be granted credit for that course but not the grade for that course and shall have to clear the concerned course within 1.5 year from appearing for first time in the concerned paper.
- (v) The **total grade points earned in each course** shall be calculated as –
Grade points obtained (vide Table-1) X Credits for the course
Maximum grade points that can be earned in a semester are 200.

(vi) **Semester Grade Point Average (SGPA) –**

The performance of a student in a semester is indicated by a number called SGPA. SGPA is the weighted average of the grade points obtained in all courses registered by the student during the semester. It shall be calculated as follows-

$$SGPA = \frac{\sum_{i=1}^n C_i p_i}{\sum_{i=1}^n C_i}$$

where C_i = the number of credits earned in the i 'th course of a semester for which SGPA is to be calculated (**Audit credits should not be included**).

p_i = grade point earned in the i 'th course

$i = 1, 2, 3, \dots, n$ represent the number of courses in which a student is registered in the concerned semester.

That is,

$$SGPA = \frac{\text{Total earned grade points for the semester}}{\text{Total credits for the semester}}$$

The SGPA is rounded up to one decimal places.

(vii) **Final result** – Up to date assessment of the overall performance of a student from the time of his/her first registration is obtained by calculating a number called Cumulative Grade Point Average (CGPA), which is weighted average of the grade points obtained in all courses registered by the student since he/she entered the School/Department.

$$CGPA = \frac{\sum_{j=1}^m C_j p_j}{\sum_{j=1}^m C_j}$$

where C_j = the number of credits earned in the j th course up to the semester for which CGPA is to be calculated

p_j = grade point earned in the j th course. A letter grade lower than D (i.e. grade point < 4) in a course shall not be taken into consideration for the calculation of CGPA.

$j = 1, 2, 3, \dots, m$ represent the number of courses in which a student is registered up to the semester for which the CGPA is to be calculated.

The CGPA is rounded up to one decimal places.

(viii) The final grade earned shall be as per Table 2 given below-

Table-2

CGPA	Grade
8.0-10	A+
7.0-7.9	A
6.0-6.9	B+
5.5-5.9	B
4.5-5.4	C+
4.0-4.4	C
0 -3.9	F